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# Claims

[c1] 1.A probe for analyzing fluid concentrations in a fluid to be analyzed, the probe comprising:
a probe body;
a sheet-form membrane secured to the probe body and including an open surface exposed to the exterior of the probe;
a channel formed between the probe body and the membrane through which a collector fluid can flow;
an inlet port opening to the channel to conduct collector fluid to the channel; and
an outlet port spaced from the inlet port such that the collector fluid passes through the channel from the inlet port to the outlet port in a flow direction substantially parallel to the membrane;
the channel being defined by a depth between the probe body and the membrane and a width extending substantially orthogonal to the flow direction between side limits of the channel and the width being at least 5 times greater than the depth;
and the membrane open surface includes an active area open to the fluid to be analyzed and open on an opposite side for contact with collector fluid flow in the chan-

nel and the active area is at least 20% of the total membrane area.

[c2] 2. A probe as described in claim 1 wherein the membrane is a composite including a membrane.

[c3] 3. A probe as described in claim 1 wherein the side limits of the channel include a gasket between the membrane and the probe body.

[c4] 4. A probe as described in claim 1 wherein the side limits of the channel include sidewalls defined by the material of the probe body.

[c5] 5. A probe as described in claim 1 wherein the membrane is clamped against the probe body.

[c6] 6.A probe as described in claim 5 further comprising a frame for clamping the membrane against the probe body.

[c7] 7.A probe as described in claim 6, wherein the frame includes a clamping part and a return extending from the clamping part.

[c8] 8.A probe as described in claim 1 further comprising a membrane support in the channel, the membrane support disposed between the membrane and the probe body between the side limits of the channel.

[c9] 9.A probe as described in claim 8 wherein the membrane support is in contact with the probe body and the membrane.

[c10] 10.A probe as described in claim 8 wherein the membrane support includes raised portions on the probe body extending up in the channel.

[c11] 11.A probe as described in claim 8 wherein the membrane support includes raised portions on the probe body extending up in the channel.

[c12] 12.A probe as described in claim 1 wherein the inlet port is in communication with a inlet conduit and the outlet port is in communication with an outlet conduit and wherein the inlet conduit and the outlet conduit extend through the probe body.

[c13] 13.A probe as described in claim 1 wherein the probe body includes a membrane stem on which the membrane is mounted and a fitting end connected to the membrane stem, and wherein the inlet conduit and the outlet conduit each open on the fitting end.

[c14] 14.A probe as described in claim 13 wherein the inlet conduit and the outlet conduit are configured such that the collector fluid flowing through the inlet conduit

moves in a direction substantially opposite to the direction of the collector fluid flow through the outlet conduit.

[c15] 15.A probe as described in claim 1 wherein the probe includes a fitting end for mounting the probe in a process and the probe body has a maximum outer dimension less than the maximum outer dimension of the fitting end.

[c16] 16.A probe as described in claim 1 wherein the membrane is in the shape of an elongate ribbon.

[c17] 17.A probe as described in claim 1 wherein the sheet-form membrane and the channel are considered the first membrane and the first channel and the probe further comprises a second sheet-form membrane secured to the probe body and including an open surface exposed to the exterior of the probe; a second channel formed between the probe body and the second membrane through which the collector fluid can flow; an inlet port for the second channel; an outlet port from the second channel; and a communication conduit providing fluid communication between the outlet port of the first channel and the inlet port of the second channel such that collector fluid from the first channel can flow through the hole to the second channel.

[c18] 18.A probe as described in claim 17 wherein the inlet port of the first channel is in communication with an inlet conduit and the outlet port from the second channel is in communication with an outlet conduit and wherein the inlet conduit and the outlet conduit extend through the probe body.

[c19] 19.A probe as described in claim 18 wherein the probe body includes a membrane stem on which the membrane is mounted and a fitting end connected to the membrane stem, and wherein the inlet conduit and the outlet conduit each open on the fitting end such that the collector flow flows through the first channel in a direction away from the fitting end and flows through the second channel in a direction returning toward the fitting end.

[c20] 20.A probe as described in claim 17 wherein the first membrane is mounted in a plane substantially parallel to the second membrane.

[c21] 21.A probe as described in claim 17 wherein the probe includes a fitting end for mounting the probe in a process and the probe body has a maximum outer dimension less than the maximum outer dimension of the fitting end.

[c22] 22.A probe as described in claim 17 wherein the first

membrane and the second membrane are formed as elongate ribbons.

[c23] 23.A probe for analyzing fluid concentrations in a fluid to be analyzed, the probe comprising:
a probe body including a fitting end and a stem, the stem including an outboard end opposite the fitting end, a first side and a second side;
a channel formed along the stem on its first side and second side, the channel extending along the first side from an inlet adjacent the fitting end toward the stem outboard end and passing to the second side to extend from the outboard end to an outlet adjacent the fitting end and the channel being formed on the stem surface at along a portion of its length; and
a sheet-form membrane secured to the stem in a sealing configuration over the channel such that a collector fluid can pass through the channel from the inlet to the outlet, the membrane including an active exposed to the exterior of the probe and the collector fluid passing through the channel.

[c24] 24.The probe as described in claim 23 wherein the probe body has a maximum outer dimension less than the maximum outer dimension of the fitting end.

[c25] 25.The probe as described in claim 23 further wherein

the channel includes a first open side, a second open side and a portion passing through the body to connect them and the membrane is formed of a first membrane secured to the membrane stem over the first open side and a second membrane secured to the membrane stem over the second open side.

[c26] 26.The probe as described in claim 25 wherein the first membrane and the second membrane each are elongate having side edges and the first and second membranes are each clamped against the probe body by a device including a frame secured by a plurality of fasteners spaced along each of the side edges.

[c27] 27.A method of analyzing a fluid for the existence of a component of interest, the method comprising:
using a probe as described in claim 1;
inserting the probe to the fluid so that at least the active area of the membrane is in contact with the fluid;
providing a collector fluid to the probe, the collector fluid passing through and exiting the probe; and,
passing the exiting collector fluid on for analysis.

[c28] 28.The method of claim 27 wherein the collector fluid is continuously or intermittently provided to the probe.

[c29] 29.The method of claim 27 wherein the collector fluid is

continuously or intermittently passed on for analysis.

[c30] 30.The method of claim 27 wherein the collector fluid is passed on to an analysis circuit.

[c31] 31.The method of claim 27 wherein the collector fluid is passed on to a unit capable of determining the presence of the component of interest.

[c32] 32.The method of claim 27 wherein the exiting collector fluid is dried.

[c33] 33.The method of claim 27 wherein the fluid is at a pressure greater than the collector fluid and the channel includes a membrane support for supporting the membrane against collapsing to obstruct the channel.

[c34] 34.The method as described in claim 27 where the fluid to be analyzed is a drilling fluid including but not limited to water-based mud, diesel invert mud, synthetic oil-based mud, or fluids used in underbalanced drilling such as nitrogen, air, or a mixture of the above mentioned drilling fluids.

[c35] 35.The method as described in claim 27 in an application for mudlogging and the component of interest includes one or more of hydrocarbons, vapors, permanent gases or volatiles.

[c36] 36.The method of claim 35 wherein the component of interest is analyzed using a catalytic combustible detector, a spectrophotometer, a chromatograph or a thermal conductive detector.

[c37] 37.The method as described in claim 27 wherein the collector fluid flow rate is adjusted to adjust the concentration of the component of interest in the collector fluid.

[c38] 38.A method of analyzing a fluid for the existence therein of a component of interest, the method comprising:
using a probe as described in claim 23;
inserting the probe to the fluid so that at least the active area of the membrane is in contact with the fluid;
providing a collector fluid to the probe, the collector fluid passing through and exiting the probe; and,
passing the exiting collector fluid on for analysis.

[c39] 39.The method of claim 38 wherein the collector fluid is passed on to an analysis circuit.

[c40] 40.The method of claim 38 wherein the collector fluid is passed on to a unit capable of determining the presence of the component of interest.

[c41] 41.The method of claim 38 wherein the collector fluid is

continuously or intermittently provided to the probe.

[c42] 42.The method of claim 38 wherein the collector fluid is continuously or intermittently passed on for analysis.

[c43] 43.The method of claim 37 wherein the exiting collector fluid is dried.

[c44] 44.The method as described in claim 38 where the fluid to be analyzed is a drilling fluid including but not limited to water-based mud, diesel invert mud, synthetic oil-based mud, or fluids used in underbalanced drilling such as nitrogen, air, or a mixture of the above mentioned drilling fluids.

[c45] 45.The method as described in claim 38 in an application for mudlogging and the component of interest includes one or more of hydrocarbons, vapors, permanent gases or volatiles.

[c46] 46.The method as described in claim 38 wherein the collector fluid flow rate is adjusted to adjust the concentration of the component of interest in the collector fluid.

[c47] 47.An apparatus for analyzing a fluid for a component of interest, the apparatus comprising:
a membrane probe as described in claim 1;
a mounting configuration to install the probe in the pro-

cess fluid to be analyzed;
a main unit including any of an analyzer, a flow conditioning/measuring device for a collector fluid, or a power supply; and
connections between the main unit and the probe including an incoming flow line from the main unit to the probe and an outcoming flow line from the probe to the main unit.

[c48] 48.The apparatus as described in claim 47 where the collector fluid is air.

[c49] 49.The apparatus as in claim 47 further comprising a membrane coaxial tubing in the outcoming flow line such that the outcoming flow from the probe to the main unit is dried during transport therethrough.

[c50] 50.The apparatus as in claim 49 wherein the coaxial tubing accommodates the collector flow in its inner core and a flow of drying gas through an outer annulus.

[c51] 51.The apparatus as in claim 47 further comprising flow control means and wherein a sample concentration range brought to the main unit by the collector fluid is switched using selected flow values for the collector fluid.

[c52] 52.The apparatus as in claim 47 wherein the analyzer in-

cludes a catalytic combustible detector, a spectrophotometer, a chromatograph or a thermal conductive detector.

[c53] 53.An apparatus for analyzing a fluid for a component of interest, the apparatus comprising:
a probe as described in claim 23;
a mounting configuration to install the probe in the process fluid to be analyzed;
a main unit including any of an analyzer, a flow conditioning/measuring device for a collector fluid, or a power supply; and
connections between the main unit and the probe including an incoming flow line from the main unit to the probe and an outcoming flow line from the probe to the main unit.

[c54] 54.The apparatus as described in claim 53 where the collector fluid is air.

[c55] 55.The apparatus as in claim 53 further comprising a membrane coaxial tubing in the outcoming flow line such that the outcoming flow from the probe to the main unit is dried during transport therethrough.

[c56] 56.The apparatus as in claim 55 wherein the coaxial tubing accommodates the collector flow in its inner core

and a flow of drying gas through an outer annulus.

[c57] 57.The apparatus as in claim 53 further comprising flow control means and wherein a sample concentration range brought to the main unit by the collector fluid is switched using selected flow values for the collector fluid.

[c58] 58.The apparatus as in claim 53 wherein the analyzer includes a catalytic combustible detector, a spectrophotometer, a chromatograph or a thermal conductive detector.

[c59] 59.A method of analyzing a sample fluid for the existence of a component of interest, the method comprising:
providing a semi permeable probe including a membrane permeable to the component of interest;
providing an analyzer, the analyzer being effective at a selected concentration range for the component of interest;
inserting the probe to the sample fluid so that at least the active area of the membrane is in contact with the sample fluid;
providing a collector fluid to the probe, the collector fluid passing through and exiting the probe;
passing the exiting collector fluid to the analyzer for

analysis for determination of the measured concentration of the component of interest; and
adjusting the collector fluid flow rate to bring the measured concentration into the selected concentration range in which the analyzer is effective.

[c60] 60.The method of claim 59 wherein the analyzer includes a catalytic combustible detector and the flow rate is adjusted to maintain the measured concentration below an upper limit of the selected concentration range in which the detector is effective.

[c61] 61.The method of claim 59 wherein the exiting collector fluid is dried by passing through a membrane coaxial tubing.